Estimation of Disaggregated Freight Flows via a Real-Valued Genetic Algorithm

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Abstract

This presentation introduces a method for estimating indirectly the interregional transportation of certain commodities in those cases where their flows are not readily available and only aggregated flows per origin-destination (OD) pair are provided. Our method involves the use of a classical doubly-constrained gravity model embedded into an optimization problem that aims at finding an OD matrix of aggregated flows that is as similar as possible to the available data, in the sense of the standardized root mean square error (SRMSE). Different deterrence functions within the gravity model are put to the test and each of them is used in conjunction with a real-valued genetic algorithm in order to determine the option that yields the best fit. In turn, the genetic algorithm employs a combination of global and local searches to find the best set of parameters for each deterrence function under study in the gravity model.

Throughout this presentation, this methodology is applied directly to the case of estimating the disaggregated flows of ten different products among the fifteen regions of peninsular Spain between 2007 and 2016. Data are retrieved from the Spanish National Institute of Statistics and, amongst the different functions tested, we conclude that a gravity model with an exponential deterrence function provides a good fit for most of the routes and is as effective as other more complex options.

Keywords: Transport modeling, Metaheuristics, Logistics, Spatial models

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